

ON AN UNDESCRIBED *ANODOONTA* FROM THE ENGLISH
WEALDEN FORMATION, WITH REMARKS ON THE OTHER
UNIONIDÆ OF THE SAME PERIOD.

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PLATE I.

THE typical Wealden deposits of the South of England occupy a large tract of Sussex, Kent, and Surrey, which is enclosed by the Chalk escarpments of the North and South Downs. Extensions of the same formation occur beyond this region, more especially in the Isle of Wight and Dorsetshire. These strata have yielded a remarkable fauna and flora, such as minute Ostracoda, delicate insect remains, mollusca, fishes, reptiles of great size like the *Iguanodon*, ferns, cycads, and other plants. All these organisms serve to indicate that the deposits containing them were of an estuarine or lacustrine character, and that freshwater conditions prevailed during their period of sedimentation. A considerable literature exists on the Wealden fossils, the basis of which is to be found in the works of Gideon Algernon Mantell, mostly published between 1822 and 1851. For our knowledge of the Unioniform mollusca of this period we are, however, almost entirely dependent on the writings of James de Carle Sowerby,¹ who described, as early as 1828, several forms of *Unio* collected by Mantell from quarries in the Tilgate Forest area of Sussex, as well as some further species in 1836-7 from Sussex localities, also collected by Mantell, which were in illustration of W. H. Fitton's memoir "On some of the Strata between the Chalk and the Oxford Oolite". In 1844 Mantell² described and figured in outline the now well-known *U. Valdensis* which he had discovered in the Wealden beds of the Isle of Wight (near Brook), comparing it with some of the recent massive forms of that genus found in North American waters, such as *U. purpuratus*. Further figures of this species were published in 1846 by James de Carle Sowerby,³ but without text, Mantell⁴ also issuing in the following year some excellent illustrations of the same shell, with an extended notice of its history.

The species of *Unio* thus referred to comprise *aduncus*, *antiquus*, *compressus*, *cordiformis*, *porrectus*, *Mantelli*, *Martini*, *Gualteri*, and *subtruncatus*, all of Sowerby, whilst the history of *Valdensis*, as stated, is entirely due to Mantell. It is of interest to mention that with the exception of two of these species (*Gualteri* and *subtruncatus*)

¹ J. de C. Sowerby, Mineral Conchology, 1828, vol. vi, pp. 189-92, pls. 594-5, and Trans. Geol. Soc. London, 1836-7, ser. II, vol. IV, p. 346, pl. XXI, figs. 14-17.

² Mantell, Amer. Journ. Sci. (Silliman), 1844, vol. XLVII, pp. 403-6, figs. 1-3.

³ J. de C. Sowerby, Mineral Conchology, 1846, vol. VII, pl. 646.

⁴ Mantell, London Geological Journ., 1847, No. 2, pp. 41-4, pl. XIV.

the remaining types are preserved in the British Museum. Although new material has come to hand since this early work was accomplished, no attempt has since been made by palæontologists in this country to increase our knowledge of these freshwater shells, but through the researches of Koch,¹ Dunker,² Struckmann,³ Parent,⁴ and others, we learn that some of the English species of *Unio* are closely related to certain forms found in the Wealden areas of Germany, France, etc.

The Spanish Wealden beds also exhibit a similar resemblance, Messrs. Palacios & Sanchez⁵ having discovered a large *Unio* showing affinities with the English *Valdensis*.

With regard to the genus *Anodonta*, one of the edentulous members of the Unionidæ, it may be said to be of particularly rare occurrence in rocks of Mesozoic age, and the species about to be described from the Wealden strata is probably the oldest authentically known from this or any other country. Certain species have been published which have since been relegated to other genera, as for instance Quenstedt's⁶ *Anodonta lettica*, as well as *arenacea* and *dubia* of Oscar Fraas,⁷ all from the German Trias, which Alberti⁸ has recognized as belonging to his genus *Anoplophora*.

Again, Mathéron's⁹ *U. Gardanensis*, from the uppermost French Cretaceous, although placed by some authors in *Anodonta*, is more probably a form of *Spatha*, as suggested by Sandberger.¹⁰ The latest Cretaceous beds (Laramie Group) of North America have, however, produced a well-recognized form of the genus in *Anodonta propatoris* of C. A. White,¹¹ which is said to have the general aspect of modern types of this genus as found in the rivers of that country.

In Palæozoic times there thrived a large freshwater shell which had been described by W. H. Baily as *Anodonta Jukesi*, but which has since been recognized under the genus *Archanodon* of Howse.¹²

Ludwig¹³ has reported a number of shells as *Anodonta* from the Palæozoic freshwater deposits of the Oural country, but from an

¹ Koch & Dunker, Beiträge Norddeutschen Oolithgebildes Versteinerungen, 1837, pp. 58-9, pl. vii.

² Dunker, Monographie Norddeutschen Wealdenbildung, 1846, pl. xi, pp. 26-8.

³ Struckmann, Die Wealden-Bildungen von Hannover, 1880, pls. i, ii, pp. 64-70.

⁴ Parent, "Le Wealdien du Bas-Boulonnais": Ann. Soc. Géol. Nord, 1893, vol. xxi, p. 50.

⁵ Palacios & Sanchez, "La Formacion Wealdense Soria y Logrono": Bol. Com-mapa Geol. Espana, 1885, vol. xii, pp. 136-8, pls. vi, vii.

⁶ Handbuch der Petrefactenkunde, 1852, pl. xlv, fig. 16, p. 529.

⁷ Oscar Fraas, "Ueber *Semionotus* und einige Keuper-Conchylien": Württembergische Nat. Jahresh., 1861, vol. xvii, pp. 81-101, pl. i.

⁸ F. von Alberti, Ueberblick über die Trias, 1864, pp. 133-41.

⁹ P. Mathéron, Catalogue méthodique et descriptif des Corps Organisés Fossils, Bouches-du-Rhône, 1842, p. 170, pl. xxiv, figs. 4, 5.

¹⁰ F. Sandberger, Die Land- und Süswasser-Conchylien der Vorwelt, 1871, Heft iii, p. 95.

¹¹ C. A. White, 12th Ann. Rep. U.S. Geol. Surv. Territories for 1878, part i, 1883, p. 61, pl. xxiv, fig. 2.

¹² R. Howse, Nat. Hist. Trans. Northumberland, 1878, vol. vii, p. 173, pl. xiv; and R. B. Newton, Geol. Mag., 1899, pp. 245-51.

¹³ Ludwig, Palæontographica, 1861, vol. x, pp. 19-22, pl. iii.

examination of the types these have been considered by Mr. Wheelton Hind¹ as belonging to the genus *Carbonicola*.

Some few forms of *Anodonta* are found in Tertiary formations, although the evidence seems to prove that probably from a generally thin and delicate shell-structure, the genus is sparingly distributed geologically, and that so far as can be ascertained no true examples appear to be known below the Wealden formation.

ANODONTA BECKLESI, n.sp.

"A large *Anodon* (?)," S. H. Beckles, "On the Lowest Strata of the Cliffs at Hastings": Quart. Journ. Geol. Soc., 1856, vol. xii, pp. 291, 292.

Description.—Valves oblong, suboval, sometimes sub-quadrangular, thin-tested, length usually about $1\frac{1}{2}$ times in excess of the height, widely inflated over the umbonal region, afterwards compressed to the margins; dorsal line well below umbonal region, straight, nearly parallel with ventral margin, angulated at both ends; anterior side short, well rounded; posterior surface oblique, wide, much depressed, produced, obliquely margined, subangulate at ventral corner, furnished with a prominent, more or less concave, obtuse ridge extending from the umbones to the postero-ventral angle, followed by one or two obscure oblique costæ, which, like the ridge, originate at the umbones; ventral margin extensive and curved; umbones anterior, more or less polished, bending inwards, having the dorsal margins of umbonal region elongate, flattened, and nearly parallel with each other; sculpture consisting of periodical, nearly equidistant, concentric growth-lines, with finer striations within, which become subangulate at the postero-ventral corner, and then assume an upward oblique direction to meet the dorsal margin. Crossing the concentric lines is a series of extremely fine and elevated, mostly equidistant, radial striations which extend from the umbones to the margins, occurring occasionally in pairs, and frequently interrupted, when the broken lines exhibit fine tapering ends which are laterally disposed without touching. Between the main radial striations are numerous finer lines taking the same direction. Hinge characters unknown.

Dimensions of two examples in millimetres.

	A	B
Height	92	78
Length	144	100
Umbonal diameter of both valves when closed	30	20

Remarks.—This description applies to a generally large form of *Anodonta*, examples of which in the British Museum were collected by Mantell, Samuel Beckles, and in more recent years by the late Philip Rufford. Beckles, as far back as 1856, referred "to a large *Anodon* (?)" being found in the Hastings deposits, which probably included the form now described, although his statement might also have had reference to a much larger freshwater bivalve commonly found in this formation, but which, from a recent examination of

¹ W. H. Hind, Mon. Pal. Soc., 1894, p. 24.

